to show three to five segments. The spindle of the first division is transverse to the long axis of the basidium, as in the whole series of Basidiomycetes, beginning with the Tremellales. The processes of division are very obscure, but there appeared to be three or four chromosomes at each pole in the anaphase. The author interprets this as a heterotypic division, but believes that during the division the components of the double chromosomes become separated, thus accounting for the presence of four instead of two at each pole. The second division proceeds without reorganization of the daughter nuclei. It results in the distribution of the components of the double chromosomes to the new nuclei. Two chromosomes appear at each pole of the spindles. The whole interpretation hinges on the correctness of the author's assumption that only two segments are formed from the double chromatic band after synapsis.

After the reorganization following the second division of the nuclei, the sterigmata bud out from the basidia and swell out into spore bodies. Then the peculiar process of migration of the nuclei into the spore bodies takes place. The nuclei move to the upper part of the basidium and lose their membranes, leaving only the nucleolus and chromatin. The chromatin thread, with the nucleolus at its apex, then migrates through the narrow sterigmata into the spore cavity. This peculiar migration is explained by the fact that during the process the nuclei are in the prophase of a division which is completed as soon as the chromatin has entered the spore cavity. The mature spore is binucleate, corresponding in this respect with other Gasteromycetes that have been investigated.—H. HASSELBRING.

Hereditary factors in Primula.—The existence of numerous varieties of the Chinese primrose (*Primula sinensis*) makes this species an enticing one for the study of unit characters in inheritance, but the number of different factors is so great as to make complete analysis practically impossible. Factors for form of foliage, heterostylism, singleness of the flower, color of stems, color of flowers, palliators, inhibitors, pattern factors, coupling, and repulsion, are all needed in the description of the results. During the past eight years BATESON and GREGORY have been analyzing the characters which distinguish the different varieties, and they have jointly and severally reported on various phases of their results from time to time since 1903. GREGORY[3] has just presented a comprehensive memoir on these experiments, illustrated with three excellent double plates, two colored and one photographic. Some of the more interesting results may be mentioned. Long style is epistatic to short style; palmate type of leaf to the pinnate or "fern" type; crenate margins to entire margins; single flowers to double; the flower colors may be arranged in a series in such manner that each is epistatic to all that follow, as follows: dominant white, magenta, red, blue, recessive white; some pale

[3] GREGORY, R. P., Experiments with *Primula sinensis*. Jour. Genetics 1:73–132. *pls.* 3. 1911.

colors are recessive to the full colors, but more commonly the lighter shades are epistatic to the intense ones and are interpreted as the result of a partial inhibitor or "palliator"; there is similar epistasis of the lighter stem colors to the darker; two inhibiting factors produce definitely localized effects in the flower, one affecting the central region of the flower, the other the periphery. In all of these unit characters the expected Mendelian ratios were obviously present except in several instances of "repulsion" and of partial coupling. Thus magenta was never found associated with the short style, and a partial coupling between magenta flower color and green stigma seems to indicate that there is a segregation on the plan 7:1:1:7 in one of the sexes, while in the other sex the segregation follows the usual plan 1:1:1:1.

The occurrence of dominant and recessive white in the flower color of the different varieties presents an interesting situation. In the varieties first investigated, the dominant white was always associated with red stems and the recessive white with green stems. An exception to this rule exists in the case of the variety "Pearl," in which dominant white and green stems are combined. KEEBLE and PELLEW[4] now report an exception in the opposite direction in "Snow King," a red-stemmed variety with either dominant or recessive white flowers. Crosses between this variety and various colored varieties gave different results according as the particular individual of "Snow King" used in the cross chanced to be dominant, heterozygous, or recessive in regard to a dominant white factor *W*. The heterozygous whites when crossed with colored varieties gave white and colored, 1:1 in the F_1, and these F_1 whites when self-fertilized produced an F_2 which in each case closely approximated the expected ratio, 13 white: 3 colored.—GEORGE H. SHULL.

An inhibiting factor in oats.—NILSSON-EHLE[5] describes a number of instances in which mutants resembling the wild oats (*Avena fatua*) have appeared in his cultures of numerous cultivated varieties of *Avena sativa*, the coefficient of mutation being about 1 in 10,000. These atavists had approximately the same congeries of characteristics regardless of the characteristics of the varieties in which they were discovered. Most frequently they were found in heterozygous combination with the cultivated varieties, but sometimes also in the pure extracted forms. That these could not have been the results of crosses with the wild oats is proved by the fact that when they appeared in a variety having white or yellow glumes, the atavist retained this recessive character. The heterozygotes proved to be in all cases intermediate between the atavists and the particular varieties in which they appeared. The fact that the atavistic type differs in each case by a single unit character, so that the whole group of wild characters appears in their

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[4] KEEBLE, F., and PELLEW, MISS C., White-flowered varieties of *Primula sinensis*. Jour. Genetics **1**:1–5. 1910.

[5] NILSSON-EHLE, H., Ueber Fälle spontanen Wegfallens eines Hemmungsfaktors beim Hafer. Zeit. Ind. Abstam. Vererb. **5**:1–37. *pl. 1*. 1911.